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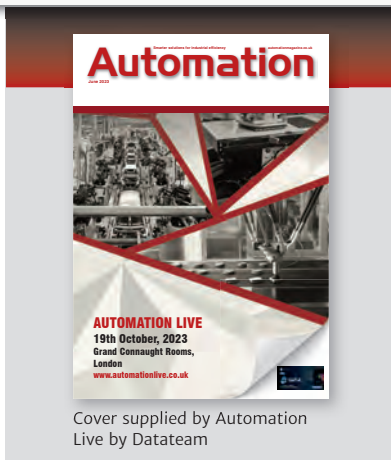
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Smarter solutions for industrial efficiency

Warehousing sector shares frustration as being overlooked for solar capacity

Responding to the UK government's new plan to reach net zero goals, the Chief Executive of the UK Warehousing Association (UKWA), Clare Bottle, has expressed growing frustration that the potential offered by industrial properties in contributing to UK's solar capacity is being ignored.

Warehousing accounts for approximately a third of all commercial roof space.

"While we welcome renewed commitment to solar power, the focus has been on homes rather than on industrial buildings like warehouses, many of which have huge roof space. The UK's 20% largest warehouses can provide 75 million square metres of roof space, equivalent to the footprint of 500,000 houses," said Bottle. "At a time when warehousing and logistics is transitioning to electrification, consumption is rising along with prices. Our recent report into solar PV on warehouse rooftops confirms that not only would this provide a reliable source of energy at lower cost for businesses, but it could also generate sufficient extra power to double UK's solar capacity in line with net zero targets."

An independent research report commissioned by the UK Warehousing Association in 2022 and produced by specialist consultancy Delta Energy & Environment (Delta-EE) shows that UK warehousing has the roof space for up to 15GW of new solar power, which could:

- Double UK's solar capacity;
- Reduce carbon emissions by two million tonnes/year;
- Cut warehousing electricity costs between 40% and 80%;
- Save the warehousing sector some £3bn per year;
- Provide a more secure power supply;
- Enable the sector to become a net producer of green electricity.

Stella Josifovska, Editor

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New COF helps develop efficient drug delivery

Researchers from Zhejiang Normal University in China and Tokyo University of Science (TUS) in Japan have jointly created a novel 3D covalent organic framework (COF) with the largest pore size and lowest density to date, suitable for many applications including efficient drug delivery.

The team has achieved this by reticulating a 6-linked triptycene and a 4-linked porphyrin linkers to form a non-interpenetrated network, resulting in the COF's large pore size and density.

Covalent organic frameworks (COFs) refer to all-organic crystalline, porous polymers that show promise for a variety of applications, including controlled drug delivery. However, their research has mostly focused on 2D COFs since it is challenging to construct a reticular 3D COF.

Now, researchers in Japan and China have synthesised a 3D COF with the largest pore size reported that demonstrates efficient loading and controlled release of five different drugs. Owing to their structural diversity, high porosity and easily accessible active sites, COFs can be designed for a range of applications such as gas storage and separation, catalysis and drug delivery.

Despite such vast potential, however, most reported COFs suffer from small pore size due to the formation of interpenetrated frameworks during the construction process, which results in closely knit interwoven structures with restricted pore sizes. Moreover, most research so far has focused on 2D COFs given the difficulty of constructing a 3D, non-interpenetrated COF with large pore sizes.

The material, which the team named TUS-64, displays a high capacity to hold the drugs, along with a sustained release rate, making it suitable for delivering drugs over extended periods.

"TUS-64 shows all the desirable qualities of a drug delivery vehicle, such as controlled release kinetics, sustained delivery and site-specific targeting," said Professor Yuichi Negishi from TUS. "By making use of these characteristics of COFs, we could create new materials that will be required in the next generation society, such as drug delivery vehicles, energy and environmental materials and separation materials."

Comau's new mobile cobot is used in three EU projects



Comau is designing a powerful mobile robotics platform as part of an open, highly-collaborative production environment, in the context of three different European projects.

The integrated solution is a modular, scalable and completely re-configurable to be easily adapted to different applications without changing the system's underlying software or hardware. Furthermore, because the robotic arm is mounted on an autonomous mobile platform, it is not tied to a single operation but can address several applications in different areas of the plant as needed.

This mobile robotics approach uses Comau's Agile 1500 autonomous mobile vehicle and the high-payload Racer-5 cobot, a 6-axis articulated robotic arm that can work at speeds to 6m/s when human operators are not present. The solution is currently being used within several European projects: *DIMOFAC*, an EU-initiative aimed at helping companies implement a smart factory architecture, where it is used for warehouse automation tasks; *PeneloPe*, where it dispenses glue and carries out non-destructive quality inspection in the public transport domain; and *ODIN*, where it manipulates mechanical parts for automotive applications, with the aim of demonstrating the technical and performance feasibility of cobots on the factory floor.

The global market for collaborative mobile robots is growing at a high rate. Some 13% of the industrial robotics market belongs to cobots, with automated mobile robots expected to achieve CAGR of 15% to 2027.

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Researchers develop portable colour-changing food spoilage sensor

A team of researchers from Pusan National University in South Korea have developed a portable molecular sensor that quickly detects the presence of biogenic amines released from spoiled food, and indicating their presence by changing colour.

Foods like fish, meat and cheese release organic nitrogen compounds, known as biogenic amines (BAs) when they decompose. When ingested in large quantities, BAs cause serious health problems, which calls for finding solutions to detect them quickly – especially during food storage and distribution.

“The rapid and easy monitoring of deleterious BAs released from spoiled foods could alert us, prevent consumption of spoiled meat, maintain food quality and establish further effective food storage and distribution conditions in the logistic chain,” said Sungbaek Seo, Associate Professor of Biomaterials Science the Pusan National University.

The University team then developed a poly-diacetylene-based sensor which offers rapid visual detection of BAs released from spoiled food. The colorimetric sensor combines polydiacetylene liposome and alginate solutions to form hydrogel. It is made of portable, lightweight beads that change colour from blue to red when in the presence of BAs, either in liquid or vapour form.

The sensor does not require complex machinery, analytical equipment or skilled personnel.

“The portable beads can be used on sites for monitoring whether the food quality is okay during storage and logistic chain. Further, the beads could be applied in evaluating whether ideal food storage and distribution conditions are well-preserved,” added Professor Seo.

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TACKLING THE HOUSING SHORTAGE WITH ROBOTS



The UK is in the grips of a housing shortage, making it harder than ever for people to buy a home. Despite ambitious annual targets set by the government, the UK has a backlog of 4.3 million homes missing from the national housing market that have yet to be built. According to the Centre for Cities, to fill this backlog would currently take at least 50 years. Another issue is not enough social homes are being built, with one million households waiting for social homes, and last year only 29,000 social homes being built, according to England Shelter.

Furthermore, the UK is experiencing a skilled labour shortage, which also affects housebuilding projects, leading to issues including project delays and rising costs as construction companies find themselves having to pay more for workers. Things need to change, and robotic automation offers the ideal solution for construction companies in creating, manufacturing and assembling components and structures.

Modular fabrication

Off-site modular fabrication, where entire sections of buildings are made in factories and transferred to site for final assembly, has recently emerged as an increasingly viable construction approach. Modular pre-fabrication offers mass customised and standardised homes, with pre-fabricated elements combined to produce different shaped structures and buildings. Robots can be used to handle a variety of tasks, including assembly and lifting of heavy items, gluing, joining, screwing, sanding, finishing surfaces, fitting windows and doors, and many others.

3D printing

Robotic 3D printing is opening new opportunities for the design and manufacture of structures and components. Complex shapes can be made in parallel, reducing energy consumption. 3D printing gives manufacturers freedom and ability to use a wide range of building materials, providing a more environmentally-friendly alternative to conventional methods like cement mixes. As such, it offers several benefits, including reduced building time, minimal waste and material consumption and stronger structures, not to mention improved brand image through improved sustainability.

To find out more about how ABB robots can help tackle the housing shortage and reshape the UK's construction industry, visit <https://new.abb.com/products/robotics/industries/transforming-the-future-of-construction>

Nigel Platt, LBL Manager, UK and Ireland, ABB Robotics

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Automation Live and the Automation Company of the Year Award



Datateam Business Media, the publisher of Automation magazine, is launching a new industry event, called Automation Live in October to address the trends and challenges seen across the industry.

“We are delighted to introduce Automation Live – Datateam and Automation magazine are ideally positioned to provide our readers and advertisers a live platform to discuss the latest technologies and trends in the industry,” said Louise Tiller, Media Director at Datateam Business Media. “We are very proud to support this thriving industry and cannot wait to see you all in London this October.”

Interactive debate

The event will be held on the 19th of October, in the Grand Connaught Rooms Hotel, London. Speakers from ABB, Kuka,

Bermondsey Electronics and more will be presenting, followed by an interactive discussion with the audience.

The goal is to open a debate with businesses about the current and future challenges they see across their sectors and how to counteract these to continue to run efficient, profitable companies during unprecedented times. The pandemic left many problems in its wake across all sectors, further exacerbated by wars and the ongoing energy crisis; then, there are the many technologies that need integrating and teaching to the workforce. In addition, current worker shortages, but also pupils who do not readily enter manufacturing and technology disciplines are further problems, all of which we will discuss at the event.

Automation Live presenters include:

- *Peter Wrigley, MD, Bermondsey Electronics;*
- *Paul Garner, Account Manager for*

Education and Collaborative Robots at ABB Robotics in the UK;

- *Neil Mead, Head of Regional Marketing, Kuka; and*
- *Stephan Pottel, Automotive Manufacturing Practice Lead, EMEA, Zebra Technologies.*

Stay tuned for more updates, and to register your interest – either as a sponsor or an attendee – contact Sam Butterworth.

Automation Company of the Year Award!

In addition to the industry debate, we are inviting companies to compete for our prestigious Automation Company of the Year Award, prepared to reward innovation, sustainability and creativity:

- Are you a manufacturer that has found a way of simplifying the production processes?
- Are you an innovator that has created a new product, process or service that breaks new ground, or reduces costs, or indeed creates a sustainable path forward to net zero?
- Have you created a training, apprenticeship or educational programme or course that will bring new generations into the fold of science, technology and manufacturing?
- Have you entered into a cooperation or partnership with another company or educational institution to add something new to industry or make things better?
- How have you contributed to the business?

All these efforts deserve to be rewarded, so we would like to hear from you. Please write to us with a few short paragraphs explaining why you deserve this award.

Let the best company win!

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High-speed, high-throughput ADC for accurate capture of information for MCUs

By Jonathan Colao, Applications Engineer, Analog Devices

Motor rotation information such as position, speed and direction must be accurate in order to produce precise drivers and controllers across a wide variety of emerging applications, such as pick-and-place machines that mount microscopic components in the limited PCB area. Since motor controls were miniaturised, they've enabled many new applications, such as in surgical robotics for healthcare and drones for aerospace and defence. The smaller motor controllers also enable new applications in industrial and commercial installations. The challenge for designers is to meet the high-accuracy requirement of the position feedback sensor in high-speed applications, while at the same time adding all components into the limited PCB space in tiny enclosures, such as robotic arms, for example.

Motor control

Motor control loops shown in Figure 1 are mainly made up of a motor, a controller and a position-feedback interface. The motor turns a rotating shaft that causes the arms of a machine to move accordingly. The motor controller instructs the motor when to apply force, stop or continue rotating. The position interface in the loop provides rotational speed and position information to the controller. This data

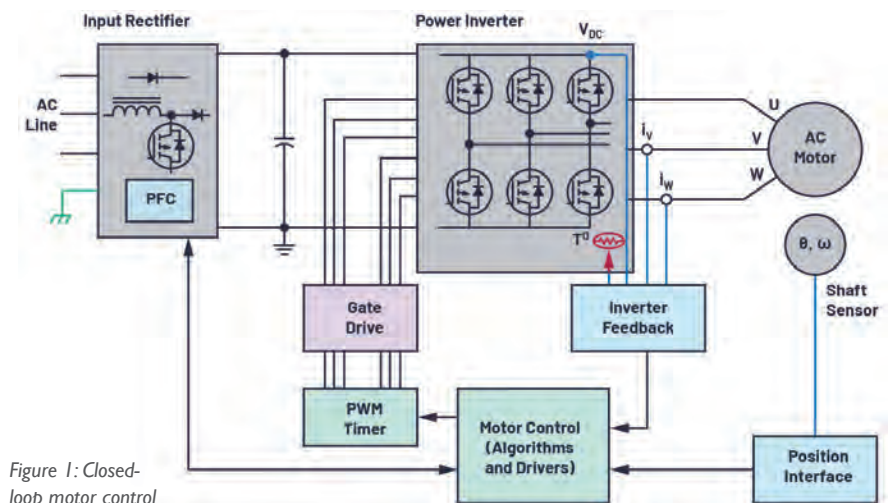


Figure 1: Closed-loop motor control feedback system

is central to the proper operation of a pick-and-place machine for the assembly of a tiny surface-mount PCB. All these applications require accurate position-measurement information about the rotating object.

The position-sensor resolution must be very high – enough to accurately detect the motor shaft position, correctly pick up a tiny component and place it accurately on the board. Also, higher motor rotational speeds lead to higher loop bandwidth and lower latency requirements.

Position-feedback system

In a lower-end application, an incremental sensor along with a comparator may

suffice for position sensing, whereas a higher-end application will require more complex signal chains. These feedback systems comprise the position sensor, followed by analogue front-end signal conditioning, the ADC and its driver before data gets into the digital domain. One of the most precise position sensors is the optical encoder, typically composed of an LED light source, a marked disc attached to the motor shaft and a photodetector. The disc features a masked pattern of opaque and transparent areas that obscure the light or allow it to pass through. The photodetectors sense the resulting light, and the on/off light signals are converted to electric signals.

As the disc turns, the photodetectors, in conjunction with the patterns of the disc, produce small sine and cosine signals, at mV or μ V levels. This system is typical for an absolute position optical encoder. The signals are fed to an analogue signal-conditioning circuit, usually consisting of a discrete amplifier or an analogue PGA, to push the signal to the 1V_{pp} range – commonly to fit an ADC input voltage range for maximum dynamic range. Each of the amplified sine and cosine signals are then acquired by a simultaneous

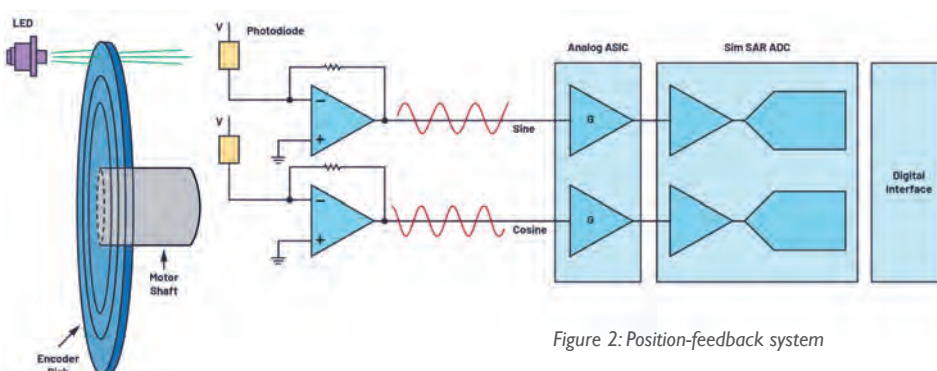
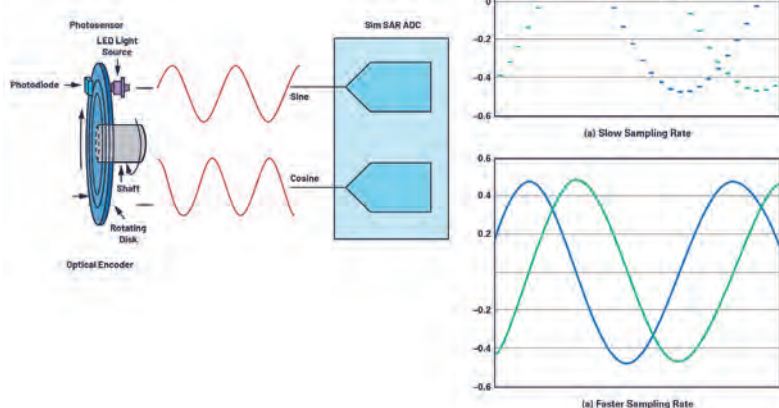


Figure 2: Position-feedback system

Figure 3: Sampling rate



sampling ADC driver amplifier.

The ADC must feature simultaneous sampling on its channels such that the sine and cosine data points are taken at the exact same point in time, as that combination provides the shaft position information. The ADC conversion results are passed to an ASIC or a microcontroller. The motor controller queries the encoder position every PWM cycle and uses this data to drive the motor based on the instructions it receives. In the past, system designers would have to trade ADC speed or channel count to fit restrictive board footprints.

Optimising position feedback

The optical encoder resolution can be based on the number of slots inscribed from fine lithography on a disc, usually hundreds or thousands. Interpolating these sine and cosine signals to a high-speed, high-performance ADC will enable us to create higher-resolution encoders without requiring system changes to the encoder disc. For example, when an encoder sine and cosine signal are

sampled at a slower rate, fewer values of the signal are captured (Figure 3); this also limits the accuracy of the position cap. In Figure 3, when the ADC samples at a faster rate, more detailed values of the signal are captured and a higher accuracy position is determined. A high-speed sampling rate of the ADC allows oversampling, further improving the noise performance, removing some digital post-processing needs. At the same time, it reduces the output data rate from the ADC; that is, allowing for slower serial frequency signals, hence simplifying the digital interface. The motor position-feedback system is mounted in the motor assembly, which can be pretty small in certain applications. So size is vital to fit in the limited PCB area of the encoder module. The emerging of multiple channel components in a single, tiny package are best suited for space saving.

Design example

An example of an optimised solution for an optical encoder position feedback system is shown in Figure 4. The circuit

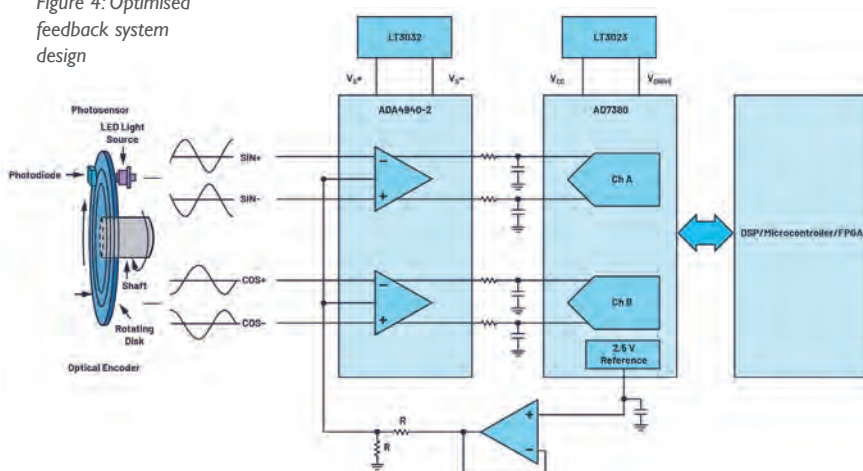
can be easily interfaced to an absolute type of optical encoder where differential sine and cosine signals from the encoder can be easily captured by the circuit. The ADA4940-2 front-end amplifier is a dual-channel, low-noise, fully-differential amplifier that drives the AD7380, a dual-channel, 16-bit, fully-differential, 4MSPS, simultaneous-sampling SAR ADC, housed in a 3mm × 3mm LFCSP package. The on-chip 2.5V reference would allow minimum component requirements for this circuit. The V_{CC} and V_{DRIVE} of the ADC and supply rails of the amplifier driver can be powered by an LDO regulator, such as the LT3023 and LT3032. When these reference designs are interfaced – for example, with a 1024-slot optical encoder that produces 1024 cycles of sine and cosine in one revolution of the encoder disc – the 16-bit AD7380 samples each encoder slot at 216 codes, overall increasing the encoder resolution up to 26 bits. The 4MSPS throughput rate ensures that detailed sine and cosine cycles are captured and encoder positions are up to date. The high-throughput rate enables oversampling on-chip, which reduces the time penalty of digital ASICs or microcontrollers feeding the precise encoder position to the motor. An extra benefit of the AD7380's on-chip oversampling is that it allows for an additional two bits of resolution, which can easily be used with an on-chip resolution boost feature. The resolution boost can further improve the accuracy, up to 28 bits. Application note AN-2003 details this oversampling and resolution boost feature of the AD7380.

Increasing demand

Motor control system demands for greater accuracy, higher speed and miniaturisation are increasing. Optical encoders are used as motor-position sensing devices. To do this, the optical encoder signal chain must have a high level of accuracy when measuring the motor position.

A high-speed, high-throughput ADC accurately captures information and feeds motor position data to the controller. The AD7380's speed, density and performance answers the industry's demand whilst enabling higher levels of accuracy and optimisation in the position-feedback system.

Figure 4: Optimised feedback system design



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The challenge of measuring Industry 4.0 RoI

By Alexandra Rangel, National PowerXpert Application Engineer, Eaton, Barry Turner, Technical Business Development Manager, Red Lion Controls, Kevin Goohs, Director of IoT Implementation Strategy, Omega Engineering, and Matt Dentino, IIoT Channel Manager, Advantech

Industry 4.0 is a set of powerful technologies and techniques that have the potential to transform the way many manufacturing companies do business. Using robots, automatic guided vehicles, autonomous cells, Internet of Things sensors and AI-based analysis, Industry 4.0 can help companies overcome the major challenges they face by providing better use of labour and equipment. It also helps continuous improvement and cost control by uncovering hidden capacity and optimising processes.

While it can bring great benefits, there are also major challenges in adopting Industry 4.0, with one of the most intractable being to prove that the project will deliver the required return on investment (RoI). Companies are accustomed to calculating RoI of new production machinery such as a new press that can produce more products with a lower cycle time, or a more efficient motor that will reduce energy costs, but with Industry 4.0, RoI is more intangible since improvements rely on better use of data rather than physical counts and measurements.

Ultimately, Industry 4.0 relies on smart technology to capture data that can be turned into knowledge that informs actions – if data is not being measured accurately, the process can't be improved. With no improvements, the technology is not delivering a return on investment.

Three key areas for improving RoI

Achieving the right RoI for a project and proving that it was achieved requires focusing on several key areas:

- **Assess key performance indicators.**

Industry 4.0 can help achieve improvements in product quality, efficiency, production availability and energy consumption. Companies need to identify their relevant KPIs in these areas

and then track them before, during and after project's implementation. In this way, manufacturers can demonstrate proven RoI. There may also be qualitative benefits that, while they don't affect profits, can result in more effective operations by, for example, making data available in a more timely manner. This could allow earlier intervention in a process to get it back into specification, hence avoiding losses and keeping product quality high.

- **Find the pain points.**

The best overall strategy for implementing Industry 4.0 is to target areas with the greatest potential for improvements that could raise profit margins. By focusing on the biggest pain points, data can be used to inform actions that improve performance. Achieving a reasonable RoI is best done through small projects that can show a measurable improvement over periods of 90 to 120 days.

- **Make more efficient use of employees.**

With labour issues and skill shortages affecting companies' operations, making better use of what can be an expensive resource is paramount. Using Industry 4.0 techniques means making better, more effective use of the workforce by avoiding the need to take physical readings of data from measurement devices and record the results on paper. Faster, more accurate readings ensure better quality and fewer complaints, boosting quality and efficiency across the plant, which helps to achieve a high overall RoI.

Rapid access to good data

Achieving a measurable RoI often depends on rapid access to data that can show where the improvements can be made in a reasonable time scale. This data needs to be aggregated via a dashboard, to display the essential information and insights that managers need.

New smart technologies are making it easier to collect and collate data rapidly,



which in turn makes it easier to manage, monitor and justify RoI. Farnell partner Advantech offers a number of data collection solutions, ranging from smart sensors to wise modules with built-in intelligence. It also offers backend solutions that enable users to 'drag and drop' different types of RoI calculations such as overall equipment effectiveness and energy usage.

The cost of not operating

Production interruptions from failed equipment can cost many hundreds of thousands of pounds in a short period of time. A recent analysis looked at a 315kW motor with a 95.5% efficiency used in a continuous process. At an energy cost of 11p/kWh and with the motor running for 8,400 hours per year, the cost of running it over a 20-year lifetime would be over £6m. This is extremely high when compared to the typical purchase price of the motor at £18,000.

Yet, the cost of not running the motor is equally significant. The analysis cited an example of a motor used in the oil and gas industry, where such a failure could lead to losses of £220,000 an hour. That means a single stoppage of ten hours over the motor's 20-year lifespan would lead to losses of £2.2m.

Investments in Industry 4.0 technologies can be justified by referring to these types of potential losses. They are commonly caused by lack of experience of predictive maintenance, which uses data and analysis to determine which machines are in danger of going offline long before they actually do so.

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Unlocking the power of process discovery

Sateesh Seetharamiah, CEO of EdgeVerve, explains how process discovery can accelerate the automation journey

With modern organisations becoming more complex, various intricate operations are constantly evolving to run business functions.

Ideally, these processes should be predictable and repetitive; however, since they have evolved differently for each team, business unit and location, this results in inconsistencies that make automation challenging and hamper the digital transformation.

Avoiding limiting factors

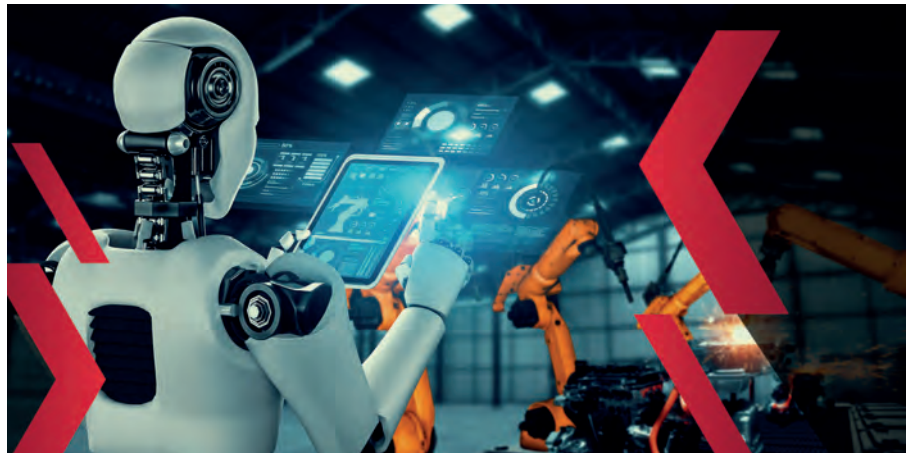
Starting automation initiatives can be a challenge for many organisations, and it's a hurdle that can significantly impact the success of any automation programme. However, studies have shown that only 3% of organisations have successfully scaled up their digital workforce, even though a well-executed robotic process automation (RPA) programme can yield a return on investment in just a year.

An Ernst & Young study found that 30-50% of RPA projects fail globally, unleashing numerous risks. As Bill Gates once said: "The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency."

Operational excellence

The key to success lies in selecting the appropriate processes for automation and ensuring that they are accurately mapped out before automation begins. Effective process discovery involves gathering information about processes and tasks from various devices throughout the enterprise to create a strong process map that enables organisations to identify the right automation processes and re-engineer them for maximum efficiency.

When it comes to process mapping, doing it manually can be a huge job. This can lead to issues like people not wanting to share information and difficulties



caused by language and cultural differences when working across different parts of the world. These factors make it more likely that important data about process performance, stability, failure rates and business impact could be missed.

However, an automated process-discovery platform can help by making recordings that accurately map out a company's processes and task flows. Using this information, the platform can identify areas where processes could be improved and create an automation blueprint. This has the potential to save organisations a lot of money and thousands of work-hours each year.

As an example, one global beverage company utilised automated process discovery to create almost 3,500 automated recordings, outlining 90% of its processes and task flows. Using this tool, the company was identified 300 different process variations and created an automation blueprint from start to finish. This led to cost savings of over \$1m per year, saving an estimated 65,000 person-hours.

Maximising automation efficiency

Automated process discovery delivers benefits beyond identifying and mapping process variations in enterprises. Businesses can improve their growth, innovation and operational efficiency whilst remaining competitive.

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The quality of data collected from various sources across the enterprise is crucial for the effectiveness of AI-driven process discovery. While errors or insufficient information affect the results negatively, reliable and accurate data can lead to significant cost savings and an eagerness to invest in further improvements.

In order to keep up with their customers' high expectations and the need for efficient business processes, businesses need to adopt digital technologies and a strong process discovery platform. The process discovery journey is crucial in creating an automation roadmap for cost-effectiveness and accelerated operational efficiency through data-driven decision-making.

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SICK develops non-contact linear encoders around flexible product platform

SICK has expanded its proven, non-contact magnetostrictive linear encoder portfolio with the launch of a versatile product family for wide-ranging industrial applications. The DAX linear encoders precisely determine the absolute position of pistons in hydraulic cylinders, as well as reliably monitoring linear motion in many common industrial machines.

The SICK DAX linear encoders have been designed with a flexible product concept to make specification quick and easy for both new and existing users, using a unique online configuration tool with options for additional customisation. They therefore offer a timesaving way for cylinder manufacturers, OEMs and end users to access a reliable source of supply.

The DAX encoder family has industry-appropriate measuring ranges for countless applications as diverse as packaging machines, wind, hydro and solar plants, wood processing machinery, or medical technology. The encoders offer space-saving benefits for new machinery, as well as backward compatibility for existing installations, and can be customised to work with all common magnet types.

"The DAX encoder represents an important milestone in the development of SICK's encoder portfolio," explains Darren Pratt, SICK UK's Market Product Manager for Measurement and Instrumentation. "The encoders open up the availability of our magnetostrictive technology to industrial users for the first time. In just a few steps, SICK's online configurator guides the user through the specification process to generate a part number and create an online order. Thanks to the platform concept of the DAX, application-specific versions can be generated quickly. There is also the flexibility of further customisation for new machine designs, or to enable adaptation to existing machines, including where proprietary magnets are already in situ."

The DAX is being launched with three



housing designs: one for integration into industrial hydraulic cylinders; a low-profile type with block magnets for mounting in tight installation situations; and a version with an integrated slider that guides the position magnet, easing the requirements on alignment during mounting.

Integration into existing or new machinery is straightforward using standard mechanical interfaces. For electrical installation, the DAX product family offers a CANopen as well as an analogue output for either 0-10VDC or 4-20mA.

Diagnostics and operating protection

Via the CANopen variant, operators have access to diagnostic capabilities to monitor both sensor parameters and environmental conditions, including the magnet signal, temperature, piston cycles/travel distance, power supply and operating hours. Diagnostics can also output speed and time profiles to monitor for changes in machine performance over time.

In addition, the DAX encoders offer significant protection to ensure machine reliability in conditions where the power supply is vulnerable to fluctuations. The DAX offers integrated over-voltage protection to enable continued operation despite power spikes, while under-

voltage conditions are alerted to the machine operator.

Flexible machine design

Machine designers are afforded significant flexibility to install the encoders in the tightest machine spaces, thanks to a minimal damping zone and an available measuring range between 50mm and 2,500mm, individually configurable in 1mm increments.

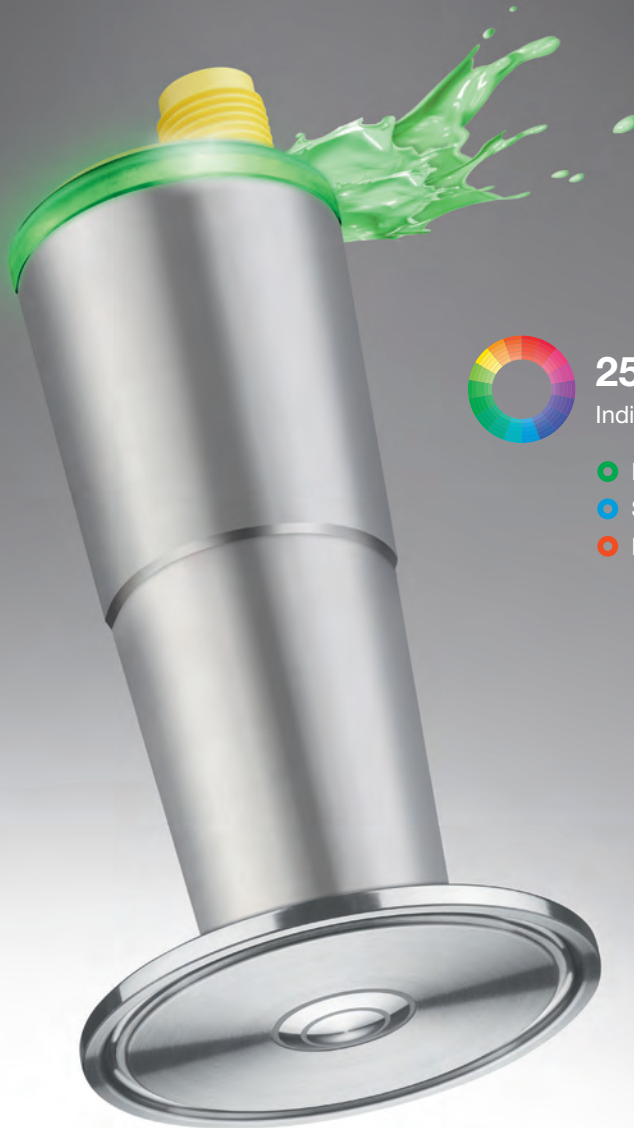
Specific variants of DAX can also use multiple magnets to provide differential values between positions along the measurement range, e.g. providing an output directly proportional to the amount of separation on a press. This feature can also be useful, for example, to enable machine adjustments for format changes.

The SICK DAX encoders offer all the advantages of non-contact, wear-free magnetostrictive technology to measure absolute position, so no reference run is required. The linear encoders have an enclosure rating of IP65 and IP67, as well as a temperature range between -40°C and +85°C. Their rugged design and high shock and vibration resistance ensures long-term machine availability even under harsh application conditions.

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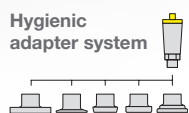
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MEMS-based solution for vibration detection in condition monitoring

By Thomas Brand, Field Applications Engineer, Analog Devices

Condition monitoring is one of today's core challenges in systems that include motors, generators and gears. Planned maintenance is becoming increasingly important for minimising risk of production downtime, not only in the industrial sector but anywhere machines are found. Among other tasks, machine vibration patterns are analysed to achieve this.

Gearbox vibrations are usually analysed in the frequency domain as multiples of shaft speeds. Irregularities in these frequencies point to wear, imbalance or loose parts. MEMS (micro-electro-mechanical system) type accelerometers are often used for measuring frequency. Compared with piezoelectric sensors, they feature higher resolution, excellent drift and sensitivity characteristics, and better signal-to-noise ratio (SNR). They also enable detection of low-frequency vibrations, close to DC.

Here we discuss a highly-linear, low-noise, wideband vibration measurement solution based on the ADXL1002 MEMS accelerometer. The solution can be used to analyse bearings or for engine monitoring and in applications where a large dynamic range (to $\pm 50g$) and a frequency response from DC to 11kHz are required.

Figure 1 shows an example circuit. The analogue output signal from the ADXL1002 is fed via a 2-pole RC filter to the successive approximation register (SAR) analogue-to-digital converter (ADC) AD4000, which converts this analogue signal to a digital value for further signal processing.

The ADXL1002 is a high-frequency, single-axis MEMS accelerometer that provides an output signal passband extending beyond the resonant frequency range of the sensor. This is desired so that frequencies outside the 3dB bandwidth can be also observed. To accommodate this, the output amplifier of the ADXL1002 supports a small signal bandwidth of 70kHz. Capacitive loads to 100pF can also be directly driven with the output amplifier of the ADXL1002. For loads above 100pF, a

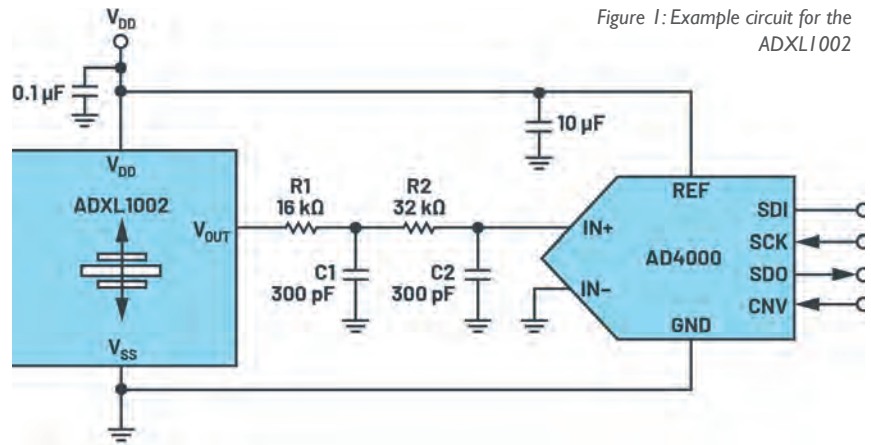


Figure 1: Example circuit for the ADXL1002

series resistor $\geq 8k\Omega$ should be used.

The external filter at the output of the ADXL1002 is required to eliminate aliasing noise from the output amplifier and other internal noise components of the ADXL1002 that arise, for example, through coupling of the internal 200kHz clock signal.

In the setup of Figure 1, where $R1 = 16k\Omega$, $C1 = 300pF$, $R2 = 32k\Omega$ and $C2 = 300pF$, attenuation of about 84dB is achieved at 200kHz. Also, the selected ADC sampling rate should be higher than the amplifier bandwidth (for example, 32kHz).

For the ADC, the ADXL1002 supply voltage should be selected for its reference because the output amplifier has a ratiometric relationship with the supply voltage. In this case, the voltage supply tolerance and the voltage temperature coefficient (which are usually connected to external regulators) run between the accelerometer and the ADC so that the implicit error associated with the supply and reference voltages is cancelled out.

Frequency response

The frequency response of the accelerometer is the system's most important characteristic. The gain increases at frequencies above 2-3kHz. The resonant frequency (11kHz), yields a peak value for the gain of about 12dB (factor of 4).

To display measuring range overshoots (over-range), the ADXL1002 has a

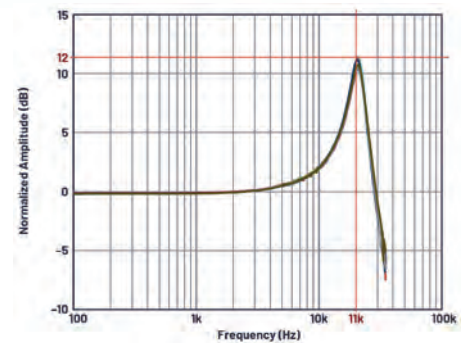


Figure 2: Frequency response of the ADXL1002

corresponding output (OR pin). The integrated monitor signals a warning when a significant over-range event occurs.

Mechanical considerations

It's important to correctly place the accelerometer. It should be mounted close to a rigid mounting point on the board to avoid any vibrations on the circuit board itself and any measurement errors due to undamped circuit board vibrations. The placement ensures that every circuit board vibration on the accelerometer lies above the mechanical sensor resonant frequency, making it practically invisible to the accelerometer. Multiple mounting points close to the sensor and a thicker board also contribute to lowering the impact of system resonance on sensor performance.

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Analog Devices
www.analog.com

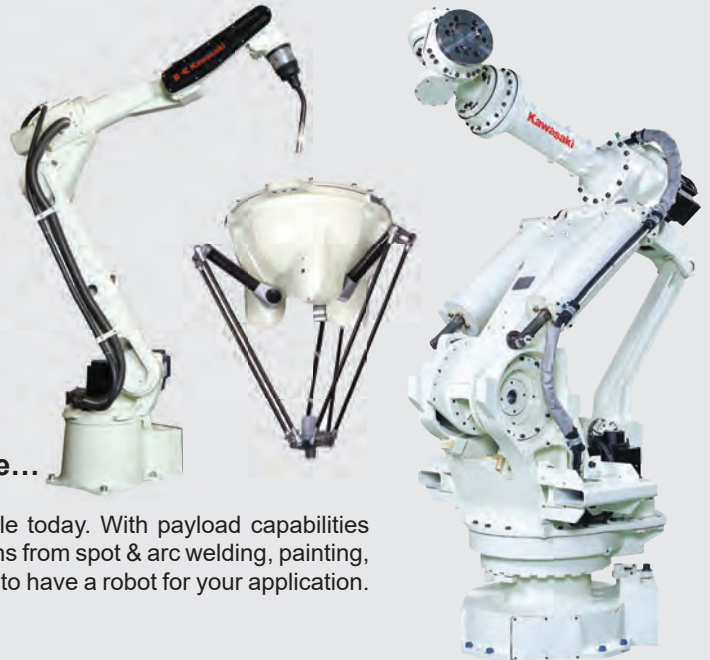


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Securing the edge is crucial in the M2M world

Edge device security is an increasingly important yet an often overlooked consideration in today's connected world. As more physical assets are monitored and controlled by or interacting with a growing number of stakeholders, the potential for malicious attacks becomes greater.

Although there is widespread understanding of the threat of cyber crime in the personal and corporate worlds for those using cloud computing, the Internet and social media, there is less awareness that an equivalent threat exists in the machine-to-machine (M2M) environment. This is despite a corresponding rise in the potential applications of edge intelligence in the Industrial Internet of Things (IIoT) era.

All the technology needed to protect against attacks on data and communications networks already exists and is well established in the IT and enterprise environment. However, it is still the case that too many users in too many industries take minimal precautions to protect their edge devices and the assets connected to them. Part of the problem is that security is not 'one size fits all', which means the most suitable solutions can only be achieved through strong partnerships between end users and edge platform vendors.

Less proprietary, more connected

Historically, applications at the edge were primarily concerned with protocol conversion, data filtering or data aggregation but today we are seeing the emergence of more advanced applications involving, for example, machine learning and edge inference. At the same time, industrial systems are becoming less proprietary and more connected and make greater use of mainstream Internet technologies such as Big Data and Artificial Intelligence (AI). In this changing world, the edge has become much more than a passive collector and translator of data. It is now the principal point of local control and decision making in such applications like intelligent factories, smart machines,



infrastructure and transportation. This means securing edge devices and the applications running on them must be the top priority in any M2M project.

Here are some essential security questions that every operator must ask when working in a large-scale edge environment:

- Can the physical attack vectors be reduced?
- Can unauthorised physical access be detected?
- Where and what is the Root of Trust?
- Are keys generated and stored securely?
- Can remote attestation be used?
- Has everything been encrypted?
- How to lock down BIOS or equivalent?
- Can the operating system be secured?
- Is secure boot implemented?
- What about the communications link?
- Have all available security mechanisms been configured and optimised?

What an edge platform partner must offer

Most of the above may seem obvious but many device manufacturers lack the experience, skills or partner connections to optimise configurations for many applications. Even fewer use these skills to co-operate with customers to develop optimal solutions for their specific systems and security policies and fewer still have the ability to replicate and produce devices at scale with the agreed custom hardware and software configurations.

That's why for the best outcomes it is crucial to get it right when evaluating an edge platform partner and to choose one that delivers large proportions of solutions from within its own portfolio, without many different parties in the

supply chain. The lower the number of suppliers involved, the lower the risk of interface problems, especially in terms of communications system components, sensors/sensor interfaces, or application-level frameworks and solutions.

In today's increasingly standards-based, interconnected world, flexible and intelligent edge platforms provide application environments that could be shared between various departments, stakeholders and even different companies. Because these are subject to regular application and configuration updates, it is not enough for users to have remote access to application-level functionality. Instead, it is vital that they can also access and interact with the underlying operating system, firmware and even 'bare iron' hardware, to service ongoing flexibility and security requirements. More importantly, it is essential that these can be accessed remotely over a communications network, in order to minimise the number of site visits required and provide a mechanism by which security updates can be rolled out to a large number of remote sites, in the shortest possible time. That's why an edge platform partner needs to offer the facility to remotely monitor, manage and maintain an installed base of tens, hundreds or even thousands of remote devices. A good remote monitoring solution will help to predict potential problems and raise alarms about emerging issues before they escalate and affect device operation. To prevent problems with bugs or hacks to software on devices, some form of out-of-band access is essential so that interaction is possible, even if the operating system has crashed or a drive has failed.

Finally, while securing the edge is essential in the M2M world, it's worth noting that, depending on hardware, not all options will be possible for all devices.

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Ten myths about robots

By Peter Swanson, Managing Director of Intertronics

The benefits of robotics are quite compelling: improved productivity, efficiency, output, quality and flexibility. In addition to production benefits, they can also improve health and safety and job satisfaction for employees.

However, the International Federation of Robotics World Robot Report in 2021 found that the UK has a robot density below the global average of 126 robots per 10,000 employees. With just 101 per 10,000 employees, the UK ranks 24th in the world in terms of robot density.

Dispensing robots

Dispensing robots enable the automation of the application of adhesives, potting compounds, encapsulants, sealants, form-in-place gaskets, temporary masking, lubricants and other liquids, fluids and pastes.

There are several myths around the use of robots that could be holding back their uptake. Here we'll bust 10 myths about dispensing robots.

1. Robots steal jobs

They actually create them – competitive companies grow and employ more people! According to the World Economic Forum, more than half of the world's workplace tasks will be carried out by a machine by 2025. And, whilst 75 million jobs are likely to be lost to automation by 2025, a further 133 million will be created.

In addition, robots allow manufacturers to move people out of repetitive and potentially dangerous jobs, and into positions that add more value.

2. It might unsettle my team

The preconception that robots take jobs means it's vital for businesses to present the idea of robotics to the workforce and get buy-in.

If a manufacturer uses robots to automate dispensing tasks, it can actually improve job satisfaction by upskilling its team and moving workers into more creative and fulfilling jobs.

3. Robots are expensive / their price point is inaccessible



You can actually buy a dispensing robot for as little as £5,000. With added enclosures and other equipment, the cost of the project is typically from £10,000 to £20,000.

4. The payback period will be too long

Many dispensing robots are offered at a reasonable price point that delivers a short payback period.

Return on investment (ROI) can be achieved in a short time – as quickly as six months in some cases – and almost certainly within a year or two.

Importantly, they offer an incredibly short time to value. As soon as the robot is installed, the manufacturer can gain value immediately.

5. I need to run it 24/7

In fact, most people don't run their dispensing robots continuously. Many robots can be run as and when needed and they still deliver value through faster output and better quality.

6. It will be difficult to get going

For those who are yet to install a robot, a common concern is that the installation, set up and programming will be challenging.

For dispensing robots, look for a supplier who can offer dispensing robots as well as expertise, integrating the two to provide a complete installation. Offering team training on how to set a robot up, use and maintain the equipment optimally is of great benefit, too.

7. It could injure people

We provide full safety enclosures that minimise risk to the operator. In most cases, dispensing robots are moving employees out of a repetitive role working with chemicals. In these cases, introducing a robot can improve health and safety by reducing chemical exposure and decreasing the chance of repetitive strain injury.

8. It might not work the way I planned

A reliable supplier can help you throughout the process, building your confidence and proving the technology works, greatly reducing any risk.

Intertronics operates a Technology Centre in Kidlington, where our customers can run trials and tests to ensure the equipment operates as planned.

9. It won't be flexible

Dispensing robots can be offered in a way that means they can be easily reprogrammed and used for something else, so the opportunity to increase ROI is increased. It may be as simple as just adding new tooling.

10. Now isn't a good time

There is never a perfect time! Henry Ford one famously said: "If you need a machine and don't buy it, then you will ultimately find that you have paid for it, but don't have it."

However, there is a good reason to invest now due to the tax advantages.

Until March 2023, companies investing in qualifying new plant and machinery assets can claim a 130% deduction, which will allow companies to reduce their tax bill by up to 25p for every £1 they invest.

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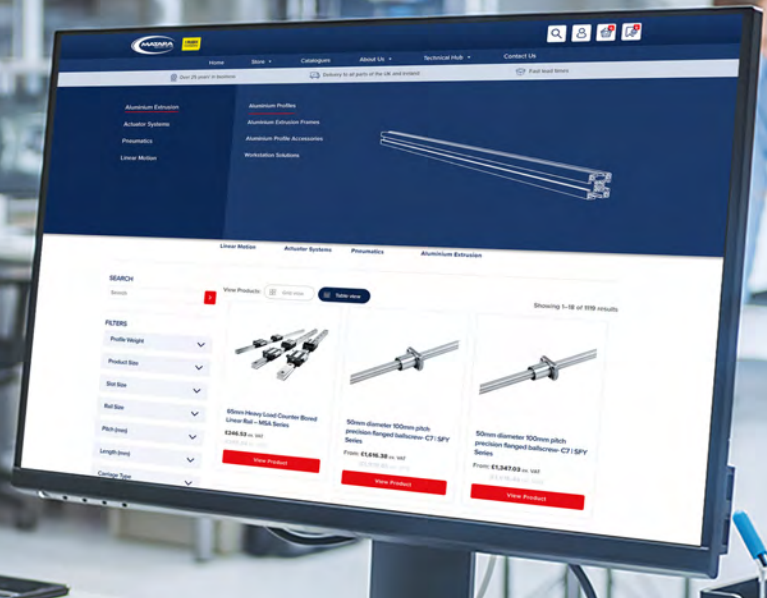
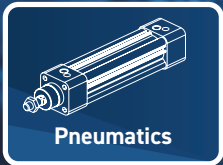
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Robot for automating wiring harness manufacturing boosts productivity by up to 3X

Q5D, a manufacturer of wire harness automation equipment for additive manufacturing, launches its first product, the CY1000

The 5-axis CNC additive manufacturing robotic cell solves the most challenging automation issue: how to automate the addition of electrical connections in increasingly complex products.

Traditional wiring harnesses are heavy, space-hungry and costly. By contrast, the CY1000 automatically, economically and securely adds components, connections and conductors into products, or components made of metal ceramic and polymer. The company calls its unique process “electrical function integration”. It eliminates the need for separate, expensive, fault-prone wiring harnesses, minimises design constraints, improves reliability and cut costs. It can also secure and simplify supply chains by removing dependence on labour. The self-contained CY1000 manufacturing cell means that wiring can be co-located with the final assembly, eliminating the costly transportation of heavy harnesses.

The CY1000 has a robust, steel-frame gantry and robotic platform. It is designed for standalone use, or for easy integration as part of a process line, where it offers full-depth access for robotic loading. Each machine can use a variety of specialised tools to add bare or insulated wire and extrude a wide range of polymers from Nylon to PEEK and Kydex. It can also pick and place electrical connectors and components. With these diverse capabilities, the CY1000 creates 3D shapes, adds components and connects them to each, together with precision integrated wiring.

The flexibility of the CY1000 is central to its capability to transform productivity. Large components or parts



(up to 1m in diameter), or multiple smaller parts, can be formed by moulding, stamping or other traditional methods before being loaded into the manufacturing cell, which locates the part and adds electrical functions as specified by the designer using a CAD/CAM based on Siemens NX, but with a bespoke motion controller, post-processor, simulator and other tools.

The CY1000's external dimensions are 2300mm wide x 2170mm long x 2320mm high and its working area is 1000mm in diameter and 300mm in height. The X and Y axes operate at 1m/s, the Z axis at 0.5m/s, and the head and bed axes move at up to 70 revolutions per minute. The machine is controlled via a touchscreen and keyboard. In addition to control functions, the screen provides an overview of the manufacturing platform status and performance, and

displays productivity and quality data, if this is available.

The CY1000, which is customised for each application, is supplied with polymer and wiring end effectors. The wiring may be bare or insulated copper, up to 3mm in diameter. Conductive ink end effectors will be available later this year.

Q5D's CEO, Steven Bennington, said: “Almost all wiring harnesses in this \$200bn+ market are made by hand at present. With the demand for wiring driven by electrification, the Internet of Things and net zero, automation is the only way to keep pace.”

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Carbon planning

Dr Torill Bigg, Chief Carbon Reduction Engineer, Tunley Engineering explains the key steps to follow to reach carbon neutrality

We are all aware that something needs to be done to reduce our carbon footprint, but many of us have no idea where to start. Of course, the best place to start is to measure what your current carbon emissions are.

1. Measure

In carbon planning you need to set a baseline by measuring your current carbon footprint. To complete this you will need to decide what to include and what to leave out – this is called setting your scope and boundary. You need to include all relevant emissions sources, and what is relevant is decided by what you have control over and what you are able to make changes to. Hence, make an inventory of the assets and activities of your business that are within your control and this is your list of carbon emission sources.

If you have a large number of assets, such as a fleet of pumping systems, then you can record that list at a higher level, such as at process level rather than individual component asset level.

Next, you'll need to calculate the amount of carbon emissions from each of these sources – each for one year's worth of carbon emissions. Start by recording data that you already have against each of your assets and activities. For example, you might know the total amount of electricity used per site or per submeter, by all of your electrical equipment in kWh from your electricity invoice or from your meter reading. Or, you may be operating a 12kWh pump at 80% power for five hours a day, so could easily calculate the electricity used by that pump.

Record either electricity in total kWh over a year, or an inventory of assets, and sum up the total power requirement in kWh for the year. For your baseline, an annual figure of kWh of electricity is sufficient. More details later will allow you to create a carbon reduction plan, itemised asset by asset, but at this stage we are looking for the starting point.

Likewise, you should list items that use fuels directly on site, such as heating boilers that use gas, or assets that burn oil, solid fuels or other gaseous fuels.

And, again, the writing of the item or the amount of that fuel purchased for one year will give you in kWh a value for those assets.

You can repeat this for vehicles recorded in litres of fuel used, or calculate the carbon footprint from the number of miles covered by the vehicles. Also include items such as water used, which can be completed from invoices in cubic metres of water purchased and wastewater treated. Finally, include materials used and those disposed of. In an office you might be using office paper for printing or photocopying, cardboard or plastics, metals or glass in manufacturing, or aggregates in construction: listing all of them will give you the emission sources to calculate the carbon footprint.

2. Calculate

Calculating your carbon emissions is not that tricky. There are several online calculators, or use information provided by the government. These will guide you how to convert kWh of electricity, cubic metres of water and miles driven in a car into carbon-dioxide equivalents. This should complete the list of assets and activities that are emission sources, the amount of relevant emissions for carbon dioxide, such as kWh electricity or litres of diesel, and the emission figures from the government information multiplying the emission figures per litre or kWh by the number of litres or kWh gives you carbon dioxide equivalents in tonnes or kilogrammes for each individual item. A sum of these is your carbon footprint.

3. Reduce

Set realistic changes for each one of the assets and activities that are potential emissions sources. For example, you might be able to change your electricity tariff to an eco tariff, whereby the electricity you purchase is generated by a renewable source like solar panels or wind turbines. You might even be able to set a plan longer term to fit solar panels of your own and so generate your own renewable electricity and reduce your reliance on the national grid. You could fit water-saving devices, and buy electric vehicles instead of fossil-



Dr Torill Bigg, Chief Carbon Reduction Engineer, Tunley Engineering

fuel vehicles and even install charging points on the company premises and, with additional use of batteries, this could even be charged from solar panels.

The first thing to do at this stage is to reduce demand on energy so check your assets and consider their efficiency. Any asset releasing too much heat, noise or vibration is running inefficiently, meaning energy is being wasted. So, a maintenance intervention would reduce that wasted energy and automatically make your assets both more efficient and cost effective but also reduce your carbon footprint, too.

4. Report

Now is the time to share what you've found with all of your stakeholders, customers, suppliers, employees, senior management and the community: Let everybody know that you are on a carbon-reduction journey. Let them know that you have measured your carbon footprint and have set yourself carbon reduction targets. Then put the plans into action.

Monitor your success; with each new initiative measure electricity used before and after servicing machinery and equipment that had previously been inefficient; measure gas use before and after implementing insulation; calculate carbon emissions from diesel vehicles and compare them to the new calculation with electric vehicles.

Monitor monthly over the year, and in a year's time re-measure your carbon footprint – and again tell the world how well you have done.

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Sustainability matters for parts and components supply

By Edward Arnott, WDS Components Sales Manager and Sustainability Task Force



As awareness of ecological importance grows, and the impact that industry and commerce have upon it, demand for action is spreading to stakeholders in more diverse sectors and businesses. Individually, standard parts and components might not seem to carry the same importance as heavier products and processes, but their impact is just as important. From bolts to hinges, their essential use means these parts are all around us, in our daily lives as well as industry, and their supply chain is long reaching. Sustainability-conscious employees at parts and components suppliers are taking action, and customers are increasingly demanding commitments, too.

Not that environmental care is new. WDS Components has long had an Eco Task Force that has investigated ecology impact and made commitments such as reducing energy use. But sustainability is broader and resulting actions have a wider impact. For WDS, sustainability means fulfilling the needs of current generations without compromising on the needs of future generations, whilst ensuring a balance between economic growth, environmental care and social wellbeing.

At WDS, action is driven by the Sustainability Task Force. Comprising members from all departments, this ensures that the whole business takes action. This approach creates a scope that ranges from facility management of our factory, through to product development. The Task Force also includes all levels of seniority in the business, from junior employees to director level. Not only does this create innovative thinking on the issues that matter, but it also ensures the sustainability and longevity of WDS itself and its place in business and society.

The Sustainability Task Force is driven by the mission to influence WDS Components in its

endeavours to use less of the Earth's valuable resources. This is in effort to reduce the harmful effects of climate change, by becoming more sustainable, in order to improve the health and wellbeing of people, now and tomorrow. The result is a prioritised matrix of practical actions, spanning all aspects of WDS's operation, which cover both the short and long term.

Sustainability actions

Considering emissions required in transportation, our goal is to manufacture as much as possible at our plant. We're also in the process of fitting energy usage monitors to all of our production machines, combined with other initiatives such as using the most efficient light fittings, to ensuring our utility providers use renewable sources. As a result, we reduced our electricity and gas use by 3.5% last year, and we're on track to exceed that this year.

As well as sustainable production, we've also implemented a range of sustainable business practices: For example, in the workplace, our commitment to a 5% reduction in printing volume will save per year 3,500 sheets of paper and 63kW/h of energy. Getting to work, WDS has a car sharing policy to help reduce emissions, and to further decrease CO₂e, as well as helping to achieve a more sustainable working environment. We also have a cycle partnership to encourage local colleagues to ride into work. We are embarking on training programmes and personal development with sustainability at the core of these plans.

Sustainability doesn't just finish with WDS, though. We've made requirements to our supply chain, ensuring that the products, materials and services we procure originate from sustainable sources. Moreover, this is a requirement that our customers are increasingly asking for. But, customer demand is far from the only reason we've made a commitment to sustainability. Our staff are aware of the critical nature of the global environment and the societies it supports. With a company history of 70 years, sustainability is also vital to ensure that WDS continues to prosper long term.

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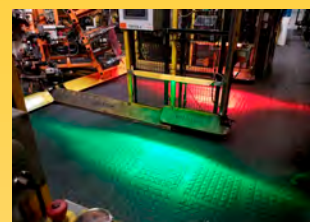
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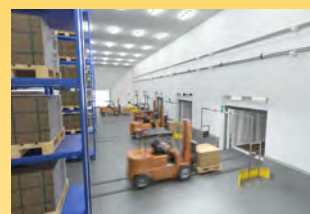
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Harnessing the power of automated vehicles

By Karla Jakeman,
Head of
Automation at
TRL



Automated vehicles have quickly become the talk of the town, with the connected and autonomous vehicles (CAV) industry and the public showing significant interest. Vehicle manufacturers are working hard to bring these vehicles to market, and many new vehicles already come equipped with various autonomous features, prompting new marketing campaigns targeting drivers. However, consumers may not understand the implications of these terms such as “self-driving”, “automated” and “autopilot”. Consequently, it is essential that those in the CAV industry better inform the public about the capabilities of automated vehicles, so that they can make informed purchasing decisions.

Automation and the current state of technology

Automated cars, or “self-driving cars”, are increasingly becoming a reality with a combination of sensors, artificial intelligence and software allowing them to navigate and drive without human input. They can recognise and respond to their environment accordingly, but the driver must be ready to take over within a split second if the car meets an unforeseen hazard or situation. As such, automated cars are a rapidly evolving technology, and while the dream of a completely autonomous vehicle may still be in the future, today’s technology is already pushing its boundaries.

Autonomous vehicles will provide unprecedented independence for people with disabilities, the elderly, and those without a driver’s license. At the same

time, they will help to reduce accidents, optimise traffic flow and contribute to Net Zero carbon emissions. It’s time to embrace the future of autonomous vehicles and all the possibilities it brings.

What does the public think?

Despite the lack of availability of autonomous commercial vehicles, many people have already formed strong (and often negative) opinions about them – even though they haven’t had any direct experience with them. This emphasises the need for public education, as researchers and manufacturers realise that people must be able to experience autonomous vehicles before they can form a non-apprehensive opinion of them. Without this education, the public may continue to believe inaccurate information and remain hesitant about embracing the technology.

Consequently, drivers’ education is essential for preparing people to use connected and autonomous vehicles safely and responsibly; responsibility for this should be shared amongst all stakeholders involved in the development, deployment, and use of these vehicles. Governments, vehicle manufacturers, tech companies and educational institutions should all work together to provide this education and information. Organising trials, for example, ensures the general public can experience CAV technology for themselves and see first-hand how it could impact their lives – will enable them to form a more positive opinion.

Role for manufacturers only?

It is essential for drivers to be

educated about automated cars, as the responsibility to understand how to operate them does not rest solely on the shoulders of the manufacturers.

While manufacturers do have an important role to play in their safety, it is arguably up to the driver to make sure they understand the technology behind the vehicle. This is especially true when the car is sold in the second-hand market, as the new owner must be aware of the risks and take steps to ensure their safety. Therefore, both manufacturers and drivers must work together to ensure that drivers are properly educated on automated cars, thus minimising the potential safety risks associated.

What will the future look like?

The future of CAVs will likely bring many changes to the way we move around. However, one thing you can count on is that people will still have a choice. For those who enjoy driving, you won’t need to fear that your days behind the wheel are numbered. Automation will be an option, but it won’t take over completely. Meanwhile, those who don’t like driving can enjoy the freedom of a car without having to drive it themselves.

No matter what the future holds, one thing is certain: automation won’t be the only choice. As the CAV industry continues to evolve, people will be able to choose the option that best suits their needs.

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Ambiq's AI-based HeartKit supercharges digital health intelligence

HeartKit is built on Ambiq's AI SDK, neuralSPOT, and enables efficient real-time heart-monitoring applications

Honeywell Ambiq is a developer of ultra-low-power semiconductor solutions that deliver a multifold increase in energy efficiency. It recently introduced Ambiq HeartKit, in addition to its neuralSPOT's Model Zoo. This highly optimised AI model enables running various real-time heart monitoring applications to help users and their healthcare providers quickly identify any irregular events to take necessary actions. As with all Ambiq Model Zoo components, HeartKit includes scripts and tools to help AI developers add real-time ECG monitoring capabilities to their health-tech applications.

Personalised health monitoring

Personalised health monitoring is becoming ubiquitous with the development of AI models, spanning clinical-grade remote patient monitoring to commercial-grade health and fitness applications. Most



leading consumer products offer similar electrocardiograms (ECG) for common types of heart arrhythmia. Ambiq's HeartKit is a reference AI model that demonstrates analysing 1-lead ECG data to enable a variety of heart applications, such as detecting heart arrhythmia and capturing heart rate variability metrics. Furthermore, by analysing individual beats, the model can identify irregular beats,

such as premature and ectopic beats originating in the atrium or ventricles.

"Ambiq's HeartKit may be the most comprehensive open-source TinyML implementation of AI-based heart monitoring for IoT end-point devices," said Carlos Morales, VP of AI at Ambiq. "The highly-optimised AI model will help developers enable healthtech applications on Ambiq Apollo4 Plus SoC in matter of minutes."

Specific models

By leveraging a modern multi-head network architecture coupled with Ambiq's low-power SoC, the model is designed to be efficient and expandable. While the pre-trained model is ready to use on Ambiq platforms, it also includes software to train, convert and deploy customised models where needed.

The HeartKit has been released under the BSD-3 license for ease of deployment and development.



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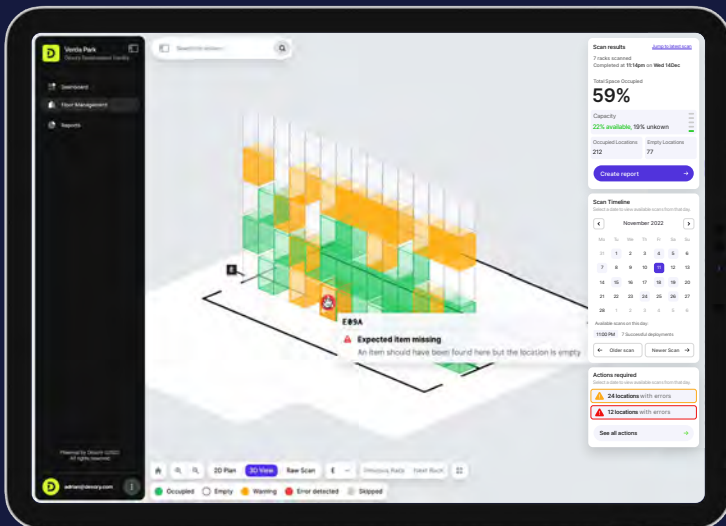
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Optimal motion control solutions for the digital pathology sector

Digital pathology instruments are important tools in modern medicine and pharmaceuticals, allowing digitisation of slides and images, which can be stored, shared and analysed more easily than with traditional microscopes.

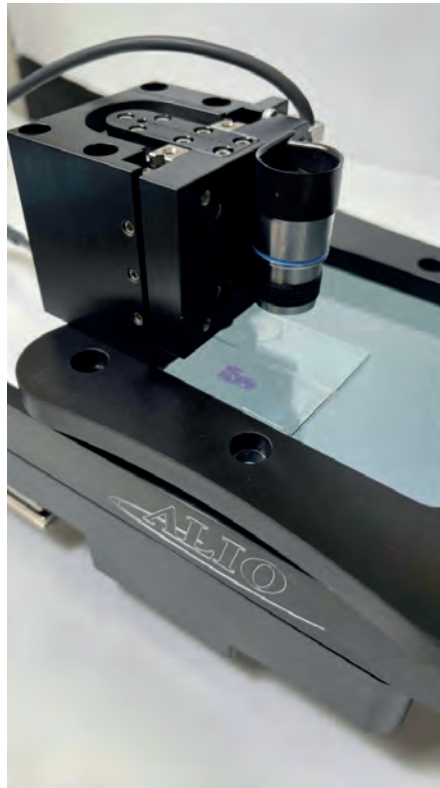
Digital pathology offers a number of efficiency benefits. For patients – due to high throughput and high speed – it reduces waiting times, provides more precise diagnosis and can speed up treatment time – all of which leading to better clinical outcomes.

In terms of efficiency, the nature of the process also enhances the quality of the pathology work flow. Digital pathology is more accurate and quicker than microscopy, prior case data can be speedily accessed, and data storage allows for long-term predictive analytics. In addition, the sophisticated nature of digital pathology instruments means the ability to offer live zoom and multiple angle views, and the ability to measure multiple areas of interest. All this improves productivity in the short and long term.

Accurate and repeatable

Digital pathology is driven by ultra-accurate and repeatable motion control systems, and ALIO Industries is offering next-generation motion control solutions to the sector thereby advancing the speed and accuracy of imaging machines.

Bill Hennessey, President of ALIO Industries said: “Our stages are perfect for the high-speed, high-quality scanning or imaging necessary for digital pathology. Offering solutions bespoke to the respective instrument’s architecture, we ensure that the final digital pathology instrument occupies minimal space in any laboratory or clinic situation. When scanning slides under a static microscope or camera, an XY(Z) motion control stage shifts the slides to capture images. For this to be effective, image capture must take place quickly and accurately meaning a motion control solution with smoothness (for high resolution images), flatness (for proper z-axis focus) and



straightness (reducing overlap between scanning passes while increasing productivity).”

The ability of ALIO stages to move straighter than any other stage on the market means that they allow the production of data with higher resolution and accuracy. The company offers many off-the-shelf options, with stages also being customisable, meaning that ALIO can work in partnership with digital pathology providers at the design stage of process development, achieving the most efficient motion control solutions for specific customer applications.

Hennessey continued: “To ensure accurate and complete tissue sample analysis, high bi-directional repeatability to target small tissue areas is needed. ALIO provides monolithic, low-profile, open-centre X, Y, Z electromagnetic-driven stages for such applications, promoting high speed, high throughput and low friction in small footprints, scan times being reduced allowing better pre-

scan images. Digital pathology is all about parallel paths or a serpentine motion to capture all the data points. ALIO is novel in that our straightness is superior to all other motion control options for this application. This promotes the compiling of data in one pass, impossible if stages cannot move parallel with less than 2-3 micron variation. This also allows more precise data since it does not need to be calculated by 6-sigma algorithms that are necessary to get a result from poor motion performance. “

The future of digital pathology

The future of digital pathology is very exciting. As more pathologists adopt this technology, ALIO will continue to innovative new motion control solutions that make digital pathology machines even more efficient and effective.

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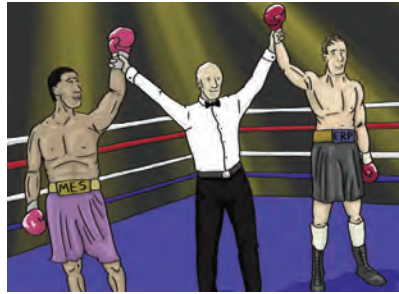


New Incremental Encoder Supports Larger Shaft Sizes, Addresses Lead Time Constraints

CUI Devices' Motion and Control Group today announced the introduction of a new series to its AMT incremental encoder family. Based on the existing AMT13 series package, the new AMT13A series is not subject to silicon related lead time constraints and can serve as a drop-in replacement for AMT13 encoder models. AMT13A encoders offer 16 quadrature resolutions from 96 to 4096 PPR, selectable via an on-board DIP switch, while supporting larger motor shaft sizes from 9 mm to 15.875 mm (5/8 inch).

Thanks to CUI Devices' proprietary capacitive ASIC technology, the AMT13A series delivers high levels of durability, accuracy, and immunity to environmental factors. It features compact radial and axial package types with a locking hub for ease of installation and low power consumption of 8 mA at 5 V. The AMT13A series also carries an operating temperature range from -40 to 125°C and offers differential line driver versions.

CUI Devices
▶ www.cuidevices.com



MES vs ERP – What's right for your business?

All manufacturers seek to increase productivity, improve efficiency, solve quality control problems, and eliminate downtime associated with re-occurring production and maintenance issues. While it is widely understood that digital transformation offers gains across all of these areas, the challenge is gaining the data visibility and context from across the whole enterprise, and not least from the factory floor. It was previously thought by many that this data capability could be achieved with an Enterprise Resource Planning (ERP) system, negating the need for a Manufacturing Execution System. SolutionsPT, AVEVA Select partner for UK & Ireland, believes that a combined approach is better and has launched a free eBook highlighting how MES and ERP should work together to deliver rapid enterprise-wide benefits.

SolutionsPT
▶ 0161 4954640 info@solutionsPT.com
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Wieland Electric presents new emergency stop buttons

Wieland Electric has such a solution ready for safety technology in mechanical engineering and intralogistics: New emergency stop buttons are available for the safe, manual shutdown of machines and systems. Thanks to the M12 connection, they can be easily integrated into plants and systems using pre-assembled M12 standard cables.



With the introduction of the new emergency stop buttons, Wieland Electric not only meets the increasing demand for M12 connections in industry, but also expands its portfolio with ready-to-use variants that offer numerous advantages due to their plug and play installation.

This includes reducing installation time and cabling effort as well as avoiding cabling errors during installation. Thanks to the compact and robust design, the emergency stop buttons can be installed in control cabinets and panels, but are also suitable - thanks to the IP65 and IP67 protection class design - for installation in the field where harsh ambient conditions prevail.

Wieland Electric
▶ 01483 531213
▶ www.wieland.co.uk

ILS FlexWipe meets growing demand for, safe, reliable pallet labelling – no matter what the temperature

Print and apply labelling specialist Industrial Labelling Systems (ILS) is seeing strong demand for its FlexWipe pallet labelling system. The combination of a small footprint, fast operation and market-leading safety standards together with the ability to work across a wide variety of temperatures down to -28°C have revolutionised pallet labelling and made it a firm favourite with customers.



To date ILS has installed over 80 FlexWipe systems across Europe, USA and Australia and is continuing to see demand grow in the past 18 months, particularly in the cold storage sector. Customers include NewCold and Lineage Logistics who have over 40 FlexWipe systems operating between them.

The robust design of the FlexWipe applicator means it is capable of operating in ultra-cold climates, without the need for additional heaters or special cabinets. Working with varying pallet surfaces – uneven, rough, or cold – the FlexWipe “wipes” accurately over the label after it has been tapered, ensuring labels stick even under the poorest adherence conditions.

ILS
▶ www.ilsystems.co.uk

Vision Engineering reinforces UK manufacturing base with Miltum acquisition

Vision Engineering, a 64 year old British leading designer and manufacturer of high-quality visual instrumentation and a significant supplier of machined components/sub assembly services to other industrial sectors, has today announced the acquisition of Miltum Precision Engineering, of Hinckley, Leicestershire, a precision engineering specialist.



The acquisition of Miltum fulfils a strategic objective to significantly improve Vision Engineering's position global position as a leading designer and manufacturer, by adding scale and capability to the company's existing UK and USA manufacturing base.

Established in 2001 and one of the first UK firms to achieve ISO 9001 2015, Miltum Precision Engineering has 21 highly skilled machinists and anodisers specialising in high quality components, including high performance lens cases for the optical /movie/ camera industries, marine and automotive engineering and high end shop/hotel fitting. Miltum also has an anodising facility to improve the quality and durability of finished components.

Vision Engineering Limited
▶ www.visioneng.com

EtherCAT delivers performance for machine builders

Controls and Automation specialist, Carlo Gavazzi continues to develop solutions for Industry 4.0 and future smart factories, making the NRG platform the system of choice for many machine builders worldwide.



As the popularity of EtherCAT rises, Carlo Gavazzi has launched an additional I/O device to its range of NRG solid state relays. The latest controller uses EtherCat to interface with the main controller to provide reliable transmission of machine data, process parameters and diagnostic data, providing a powerful solution which meets the demand for faster communication of data transfer and exchange providing real-time data monitoring, prevention of machine breakdown and accurate troubleshooting.

The NRG platform offers real-time monitoring and is focused on optimising manufacturing operations quickly and efficiently providing the user with more cost-effective processes, real-time data monitoring, prevention of machine breakdown and accurate troubleshooting. Increasing productivity and limiting supply chain disruption.

Carlo Gavazzi Automation
▶ 01276 854110
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Easily double your cable identification speed

If you're still using old technology, the time to get work done seems to disappear. Old processes slow you down, rework creates bottlenecks and errors can bring things to a full stop. Help keep things running smoothly by automating your identification.

Brady offers a family of print-and-apply machines that take the manual labelling process out of your hands so you can move through your work more efficiently and with less rework. With these modern automated machines, you can:

- Increase productivity - cut labelling time in half to keep your output numbers high
- Reduce errors - get sustainable, consistent identification without the rework
- Make changes fast - intuitive full-colour touchscreen and user interface make changing settings easy

10 seconds faster per cable

Wraparound & flag labels can be applied up to 10 seconds faster with Brady's automated cable identification solutions.

- The Wraptor A6200 Wrap Printer Applicator for Wrap-around labels in cellular manufacturing and process-driven assembly. Greater flexibility now comes in a lightweight, compact size. It's a new, automated labelling device from Brady, and it's built to boost your efficiency. Meet the Wraptor A6200 Wrap Printer Applicator.

- The Wraptor A6500 Wrap Printer Applicator significantly increase production output by identifying cables with wrap-around labels in 5 seconds
- With the BradyPrinter A5500 Flag Printer Applicator operators can significantly increase production output by flagging cables in 5 seconds

Great reliability


Dedicated labels are available for maximum reliability when using Brady's automated identification solutions. The labels themselves are of great quality and can resist challenging industrial environments. All identification materials have been tested using standard ASTM test methods for optimal reliability as described in the technical datasheets.

[Download the Automated Cable Identification Brochure >>](#)

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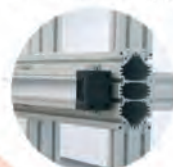
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Unmatched Durability: durable coatings designed to withstand harsh environments

Exceptional Quality: 100% tested and inspected to ensure surface quality exceeds industry standard

Product Availability: same-day shipping on over 3,000 mounted and unmounted filters

